

Memo for
your maintenance
file



TECHNICAL BULLETIN

MAINTENANCE AND MODIFICATION NOTES ON RCA BROADCAST EQUIPMENT

BROADCAST MARKETING DEPARTMENT • ENGINEERING PRODUCTS DIVISION • RADIO CORPORATION OF AMERICA, CAMDEN, N. J.

Code EJ-180R

Page 1 of 6 Pages

MI-40209 MI-40209 A

TX-1A - TX-1B COLORPLEXERS

BULLETIN #3

Revision of Bulletin Code EJ-180

SUBJECT: Suggested modifications for improved performance of the TX-1A and TX-1B colorplexers.

This Technical Bulletin describes (1) modification to prevent feed thru of the subcarrier into the burst channel, (2) a technique to properly cut the M delay cable for the aperture compensator, (3) instructions on how to make colorplexer phase adjustments without a color signal analyzer, (4) several corrections to the TX-1B instruction book, (5) instructions for the removal of modulator clamp tubes in the TX-1A and TX-1B colorplexers when using the Automatic Carrier Balance Control unit, and (6) instructions for the attenuation of output clamp disturbance or glitch in TX-1B colorplexers where modulator clamps have been removed.

R C A A M • F M • T V B R O A D C A S T E Q U I P M E N T

Section A - TX-1A - filaments - \sqrt{B} interlock.

B - TX-1A - TX-1A and TX-1B - Instructions for cutting the M delay cable for use with the Aperture Compensator, and instructions on how to make colorplexer phase adjustments without a color signal analyzer.

C - TX-1B - corrections to IB-36224.

D - TX-1A - TX-1B - Removal of modulator clamps.

E - TX-1B - attenuation of output clamp disturbance.

It is suggested that when any of the following modifications has been made, the parts list and schematic diagram in the appropriate instruction book be corrected to agree with the change.

Section A - TX-1A's Only.

I - Increase in tube warm-up time.

Referring to Instruction Book, IB-36210-T on page 9, third paragraph, second sentence, delete the phrase "a few seconds" and replace with the phrase "one minute".

II - Wiring Change to Install a \sqrt{B} filament interlock.

Refer to Figs. 1A and 1B (Pictorial and a Schematic diagram of the bracket containing) the power connections and wire accordingly.

III - Prevention of Sub-carrier feed thru into the burst channel connect a 0.1 uf - 400 volt capacitor from the tube side of the 330 ohm resistor R 276 to ground in the burst gate stage (V 33). Refer to sketches 2A and 2B

Section B

I - How to Make Colorplexer Phase Adjustments Without a Color Signal Analyzer.

Adjustments of the relative phase of the burst, I, and Q signal components at the output of the colorplexer can be made most accurately and conveniently with a phase-measuring device, such as the RCA Color Signal Analyzer. However, it is possible to make these adjustments with an oscilloscope which has a vertical amplifier flat to at least 4 megacycles, such as the RCA Type TC-524D or equivalent.

The 90-degree relationship between I and Q can be set by making use of the fact that the resultants formed by adding a 90-degree component to two signals differing in phase by 180 degrees are equal in amplitude. If the added component is not 90-degrees apart from the two signals, the resultants are not equal. The two vector diagrams shown on Figure 6 illustrate both facts.

I and Q Phasing

To adjust the 90-degree relationship between the I and Q signals, proceed as follows:

1. Connect the oscilloscope's vertical input jack to one of the color-plexer's OUTPUT test jacks. Set the PATTERN SWITCH on the RCA Color Bar Generator to position 1. Trigger the oscilloscope with horizontal drive signal. This signal may be conveniently obtained from the HOR DRIVE IN test jack, J25. Adjust the oscilloscope so as to display two or three lines.
2. Adjust the I CARRIER BAL and the Q CARRIER BAL controls, R171 and R176, to obtain minimum thickness of the black reference line on the oscilloscope display.
3. Apply the color-bar signals, then adjust the I and Q WHITE BAL controls, (R212 and R217 for TX-1A) (R25 and R38 for TX-1B), so that there is no carrier during the white pulse interval. (It is assumed that the I and Q video balance controls, R52, R248, R61, and R249, have previously been properly adjusted).
4. Switch off the M and Q channels, leaving only the I channel. In the center of this pattern, where the green and purple bar intervals are adjacent to each other, there are two signal envelopes that should be equal in amplitude but opposite in phase. See Figure 7.

With only the I signal "ON" deliberately unbalance the Q modulator (in either direction) until the carrier amplitude during the white bar interval is approximately equal to the original amplitude for the green bar. Then adjust the relative phase between I and Q (Q PHASE, C135) until the green and purple bar intervals are again equal in amplitude.

5. Switch ON the M and Q channels and adjust I and Q CARRIER BAL for a thin black reference line.

Burst Phasing

When two equal-amplitude vectors 120 degrees apart are added together, the vector sum has the same amplitude as either of the two components. See Figure 8. Therefore, the burst phase may be adjusted by making use of the fact that in a properly adjusted system, the phase of a pure purple bar interval should be approximately 120 degrees behind the phase of the burst (the exact value is 119.4 degrees, but 120 degrees is close enough).

To adjust the burst phase, proceed as follows:

1. Prior to burst phase adjustment, the colorplexer should first be adjusted for carrier balance, white balance, I and Q relative phase, and I and " amplitudes.

After the colorplexer is in proper adjustment, switch "OFF" the M channel and remove the cable at J6 which supplies the green-bar signal. In order that the color bar generator operate properly, terminate the green bar cable with 75 ohms. Removing the green signal turns the first color bar interval from white (its normal color) to purple. Therefore in the signal output, the color synchronizing burst is adjacent to a purple bar interval.

2. Adjust the burst gain so that the burst signal is equal to the amplitude of the purple signal. See Figure 9A. Then, with the "burst delay" control on the burst flag generator, move the burst into the middle of the purple bar. See Figures 9B and 9C.

3. Adjust the burst phase capacitor, C152, until the amplitude during the "purple-plus-burst" interval is the same as during the rest of the purple interval. See Figure 9D.

4. Readjust the BURST DELAY control on the burst flag generator to properly position the burst, then adjust the BURST GAIN to obtain normal burst amplitude. Reconnect the green video cable from the bar generator and switch ON the M signal on the colorplexer.

Section B

II - TX-1A's and TX-1B's (Serial Numbers up to 628).

M Delay Cable Adjustment for use with the Aperture Compensator with the colorplexer producing an NTSC signal from the RCA Color Bar Generator, remove the 3.58 MC input cable from J-7, and the red and blue bar inputs from J-4 and J-2. Terminate all three colorplexer outputs J11, J12, and J13 in 75 Ω . Connect a Tektronix 524-D oscilloscope to one of these outputs and trigger the scope with the horizontal drive signal on J-9 of the colorplexer. Set the sweep range on the scope to 1 microsecond per centimeter. Set the sweep magnifier to the 3x position. Set the trigger selector switch to - external. Turn the I and Q video balance controls clockwise on the colorplexer. Set the horizontal and the vertical beam positioning controls and the vertical gain controls on the oscilloscope so the 50% amplitude point on the leading edge of the pulse observed crosses the vertical center line of the scope reticle. This is the reference point for the following measurements:

"Q" OFF-ON switch to off.

Connect the Aperture Compensator (MI-40414) input (J3) to J39 of the colorplexer with 14 inches of RG 59/u cable provided (MI-40419 Item 2). With the approximately 32 feet of RG 65u coaxial delay

cable previously used in the M channel, connect the output (J-4) of the aperture compensator to J 40 of the colorplexer. Have the Boost control of the Aperture Compensator C.C.W. Adjust the vertical gain control of the scope if necessary and be sure the .05 usec markers are on as above. If the 50% amplitude point of the leading edge of the pulse observed does not coincide with the center line of the scope reticle, but falls to the right, the cable is too long. Count the number of markers spaces which tie on the pulse between the 50% amplitude point and the outer vertical line of the scope reticle and cutoff the same number of feet of cable.

Strip off 1/2" of outer insulation from the cut end of the RG65u and pull out 3/4" of inner conductor cleaning off the shellac. Insert the cable inner conductor in the center of J4 (Aperture Compensator Output) and ground the shield to the rim of J4. Observe the oscilloscope to see that the 50% amplitude point of the leading edge of the pulse fall within \pm .05 micro-seconds of the vertical center line. Be sure the cable is labeled with the colorplexer serial number.

Note: Recheck the settings of C25 and C30 of the TX-1B colorplexers after installing the correctly cut cable.

Section C. Correction of instruction book IB 36224 (TX-1B only).

- I. On page 27 of IB 36224 delete the word adjustable in the description for T1 and T2.
- II. On Figure 4A, IB 36224-a, delete the arrow heads from T1 and T3.

Section D. When the Automatic Carrier Balance unit is attached to a colorplexer the modulator clamps become superfluous because the ACB, in itself, provides the necessary D. C. restoration. Aside from the redundancy which exists when the modulator clamps are left in place, a problem also exists in that the modulator clamps have a tendency to produce a video disturbance on the grids of the modulators due to unbalance of the clamp themselves or in the pulses driving the clamps. This video disturbance results in a subcarrier disturbance or glitch on the output of the modulators, which occurs at approximately the same time the ACB is sampling for unbalance. Therefore the ACB tends to cancel this glitch resulting in a slight carrier unbalance along the rest of the horizontal line.

To remove the modulator clamps proceed as follows:

- I. Replace the 1800 uuf capacitors C20, C22, and C23 with 0.1 μ f 400 V capacitors.
- II. Remove C31, C167, C168, C170, C171, C172, C173 and C174.
- III. Wire in new resistors R300, R301, R302, and R303 having a value of 100K, 1/2W, 5% from pin 2 of XV-14 to junction of R162-R163; from pin 2 of XV15 to junction of R164-R165; from pin 2 of XV16 to junction of R166-R167; and from pin 2 of XV17 to junction of R168-R169 respectively.
- IV. TX-1A - Replace capacitors C45, and C46 with new capacitors of 220 mmf, 500 V, 5%.
TX-1B - Replace capacitor C45 with a new capacitor of 220 mmf, 500V, 5%.
- V. TX-1A - Replace resistors R74, and R76, 1 meg., with new resistors of 100K, 1/2W, 5%.
TX-1B - Replace resistor R74, 1 meg., with a new resistor of 100K, 1/2W, 5%.
- VI. Remove V14, V15, V16 and V17.

Section E. In the TX-1B colorplexers the output clamp may put a glitch into the output signal at clamping time. This glitch is primarily caused by a slight unbalance of the clamp drive pulses. The glitch can be attenuated by a small modification of the clamp driving circuitry. This modification applies to those colorplexers in which the modification of Section D has been accomplished.

To make the modification proceed as follows:

- I. Remove R113.
- II. Wire a new resistor R304, 150 Ω , 1/2W, 5% from pin 3 to pin 4 of XT-3.
- III. Wire a new resistor R305, 43 Ω , 1/2W, 5% from pin 5 to pin 6 of XT-3.
- IV. Remove wire running from pin 3 of XT-3 to C34 and replace with new resistor R306, 100 Ω , 1/2W, 5%.

PARTS REQUIRED FOR MODIFICATIONS

<u>SYMBOL NO.</u>	<u>DESCRIPTION</u>	<u>DRAWING NO.</u>	<u>STOCK NO.</u>
C20 to C23	Capacitor: fixed, paper, 0.1 mf ± 10%, 400V.	737816-413	211508
C167	Capacitor: fixed, paper, 0.1 mf ± 10%, 400V.	735715-175	73551
C45, C46(TX-1A only)	Capacitor: fixed, mica, 220 mmf ± 5%, 500V.	727858-231	39636
R74, R300, to R303, R76(TX-1A only)	Resistor: fixed composition, 100,000 ohm ± 5%, 1/2W.	82283-207	502410
R304	Resistor: fixed composition, 150 ohm ± 5%, 1/2W	82283-139	502115
R305	Resistor: fixed composition, 43 ohm ± 5%, 1/2W	82283-126	502043
R306	Resistor: fixed composition, 100 ohm ± 5%, 1/2W	82283-135	502110

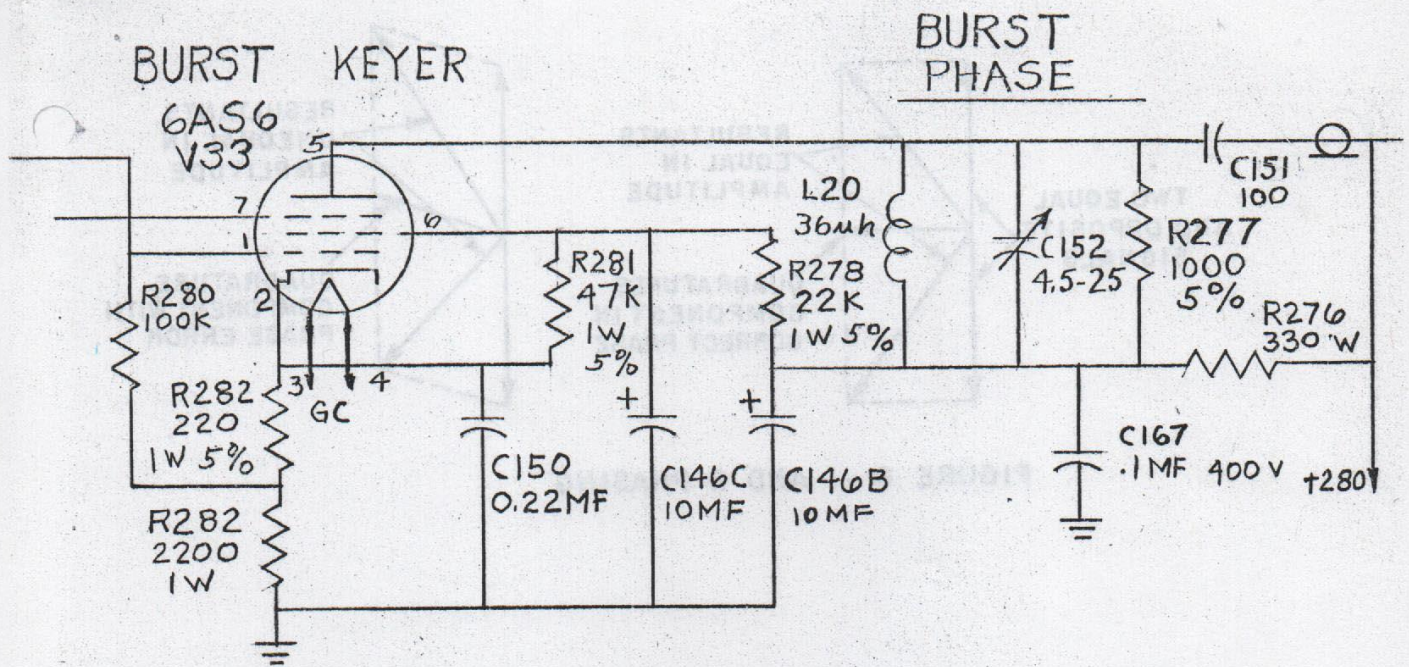
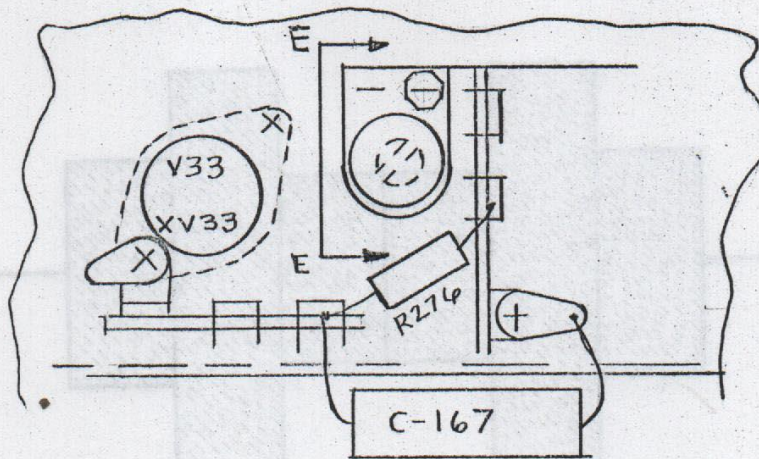


FIGURE 2A SCHEMATIC DIAGRAM



THE FOLLOWING ITEMS ARE NEEDED TO MAKE THE CHANGE
 1 - #4 TERMINAL LUG (MOUNTED ON THE RIGHT HAND TERM. BOARD)
 1 - 4-40 x 5/16 MACHINE SCREW
 1 - .1 MF - 400V CAPACITOR

FIGURE 2B CONNECTION DIAGRAM

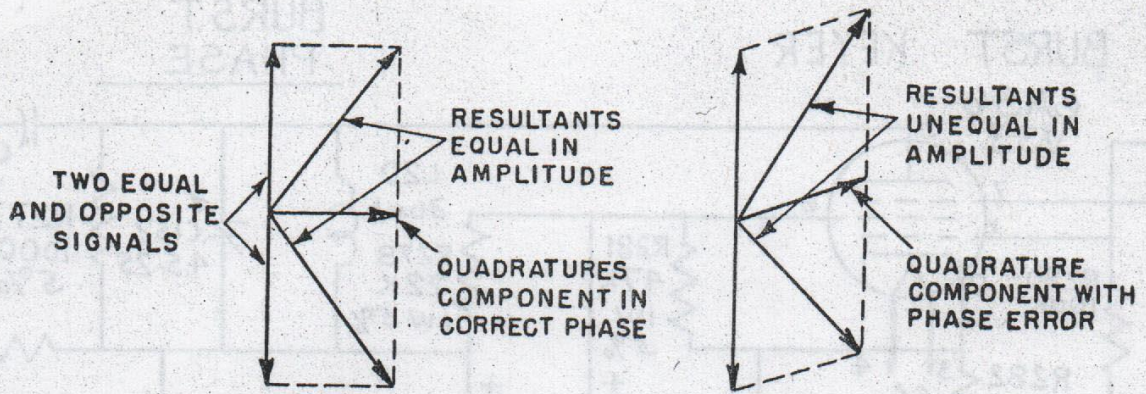


FIGURE 6 - I AND Q PHASING

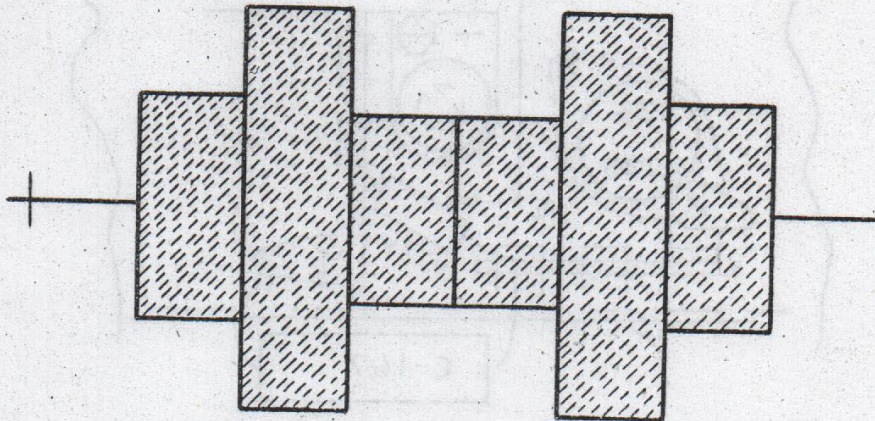
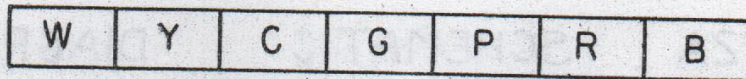


FIGURE 7 - I MODULATED SIGNAL
CORRECTLY PHASED

473179

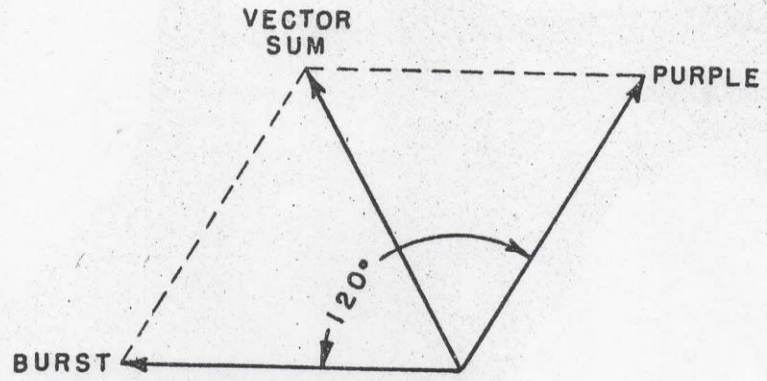


FIGURE 8 - BURST PHASING

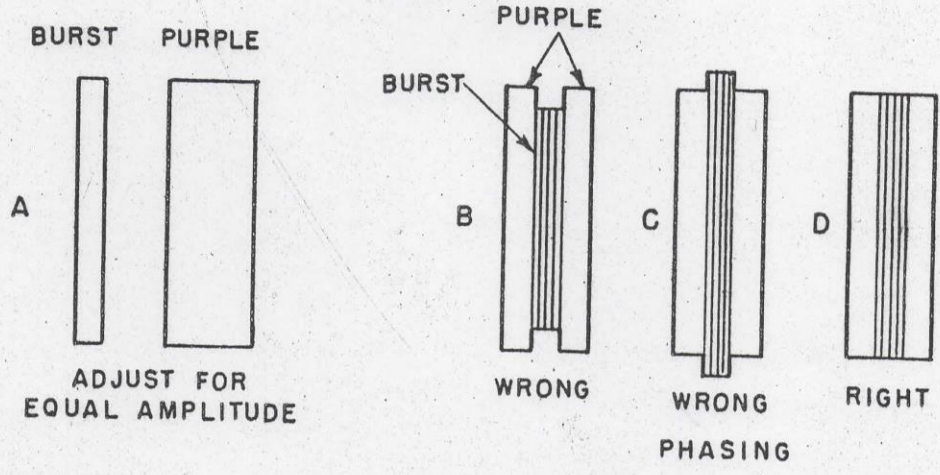


FIGURE 9 - BURST PHASING ADJUSTMENT

473180